Physical Fitness, Exercise, and Inflammatory Myopathies

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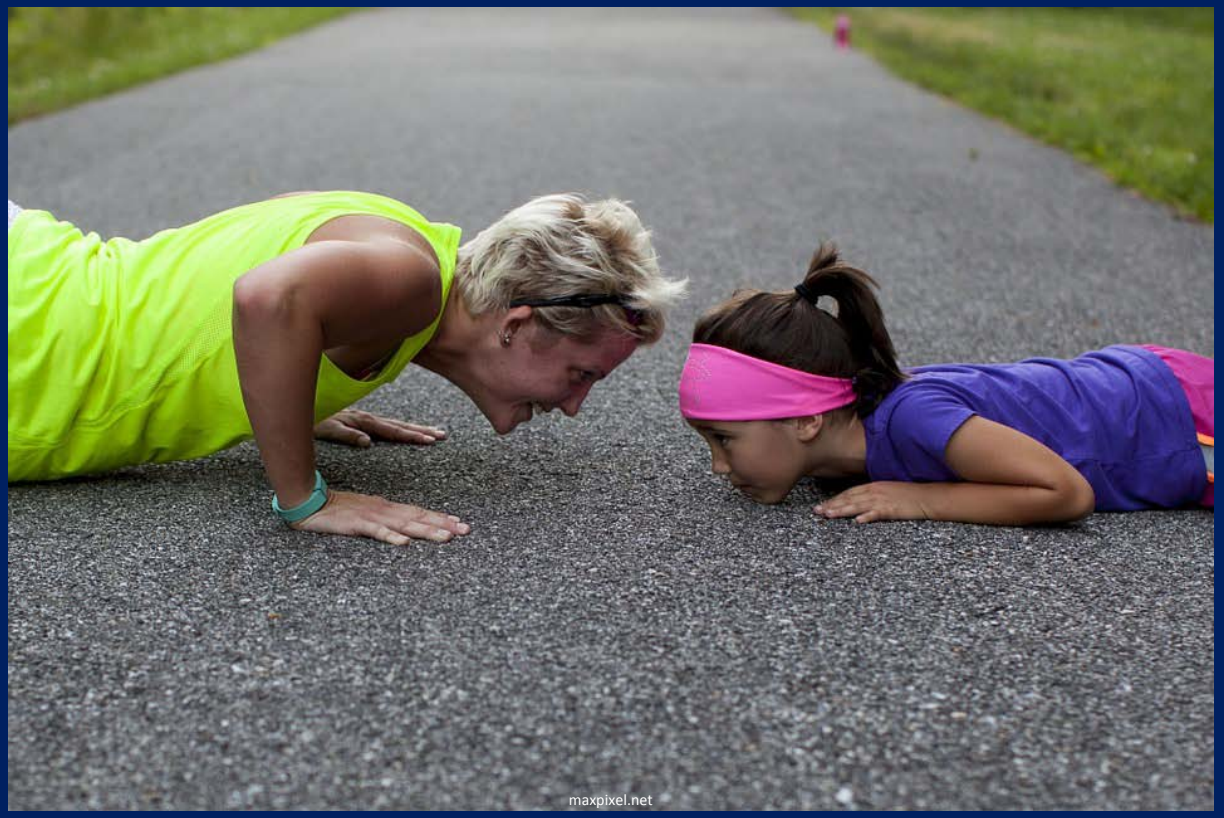
Outline

- The Vocabulary of Exercise
- What is Physical Fitness?
  - Benefits
- Traditional View of Exercise
  - General Types and Recommendations
- Current Research on Exercise and Juvenile Dermatomyositis

Who is More Physically Fit?

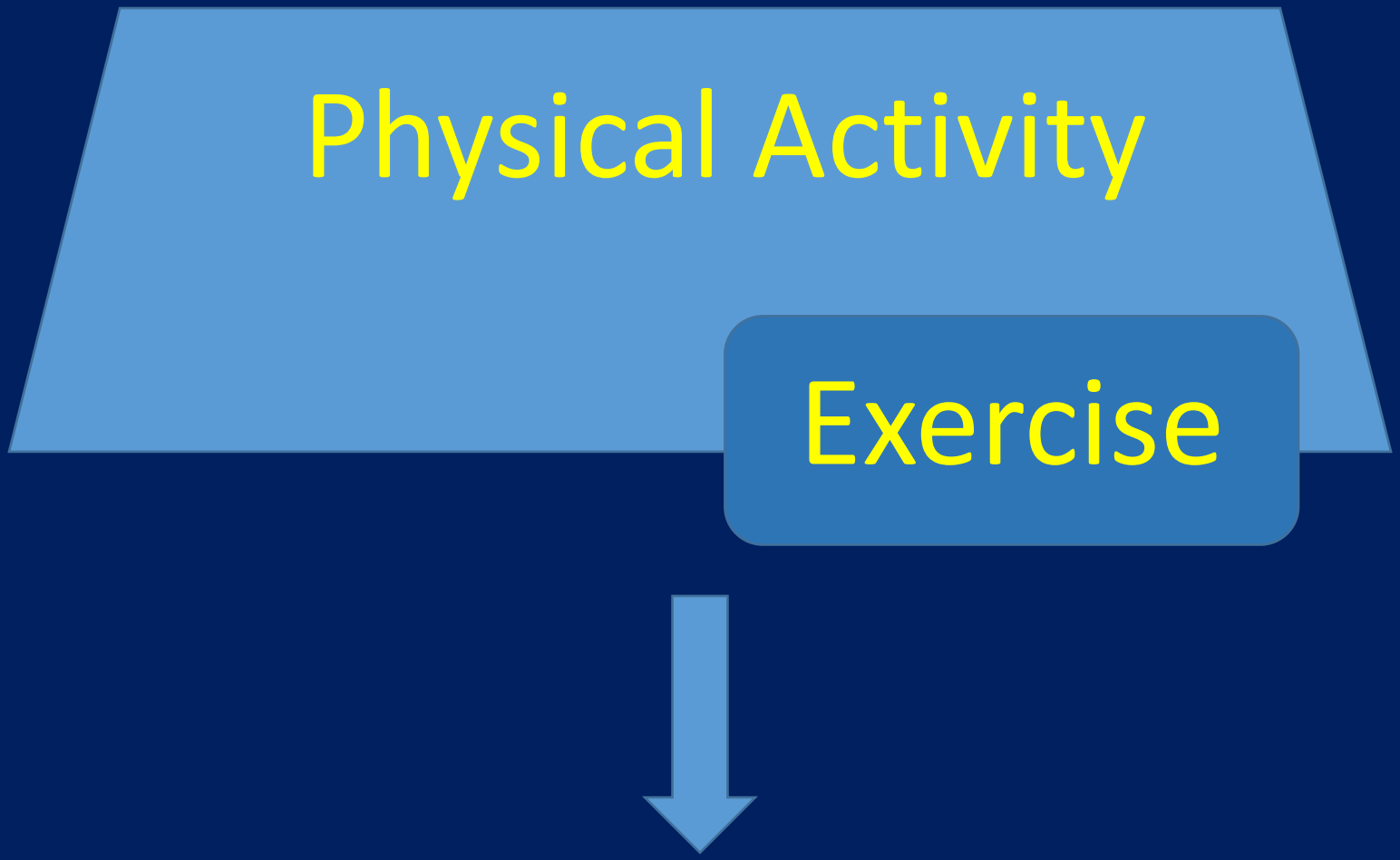


Definitions

- **Physical Fitness**:
  - “The ability to carry out daily tasks with vigor and alertness, without undue fatigue and with ample energy to enjoy [leisure] pursuits and to meet unforeseen emergencies’’ (Caspersen, 1985)
  - Components: cardiorespiratory fitness, muscular strength and endurance, body composition and flexibility, balance, agility, reaction time and power (Garber, 2011)

Definitions

- **Physical Activity**:
  - Any bodily movement produced by skeletal muscles that results in energy expenditure above resting levels, broadly encompassing exercise, sports, and physical activities done as part of daily living, occupation, leisure, and active transportation (Caspersen, 1985; Surgeon General Report, 1996)
- **Exercise**:
  - “Physical activity that is planned, structured, and repetitive and [that] has as a final or intermediate objective the improvement or maintenance of physical fitness’’ (Caspersen, 1985)


Physical Activity
Exercise
Improved Physical Fitness

Benefits of Physical Fitness

- Decreased risk for some diseases
  - Heart disease, stroke, diabetes, high blood pressure, some types of cancer
- Reduced disability related to movement
  - Walking, standing, self-care
- Improved quality of life
- Decreased depressive symptoms

How Do We Improve Fitness?

- Start by increasing physical activity
- Disrupt sedentary time
  - Sitting, playing video games, watching movies/TV
- Progress to exercise when able

Traditional Exercise

General Principles of Exercise

- *Overload Principle*
  - The body must experience an exercise challenge (or stress) beyond what it typically encounters in order to change
  - The body must experience a challenge multiple times before **adaptation** occurs
- *Progression*
  - As the body adapts, the challenge has to likewise increase in order to continue causing adaptations in the body
  - If not, plateau

General Principles of Exercise

- *Specificity*
  - The body adapts to exactly what you make it do
  - Don’t expect swimming to improve your cycling speed
- *Reversibility*
  - Any adaptations can be lost if you stop training your body
- *Dose-Response Relationship*
  - Different “doses” of exercise have different “responses” or effects

Cardiorespiratory Exercise

- "Aerobic exercise"
- Elevated heart rate, using major muscle groups
- Current recommendations for General Public:
  - 30-60 min, 5+ days a week
    - Can be accumulated in small amounts
  - Higher intensity = less time
  - Positive health benefits are observed with as little as "burning" 500 calories per week (adults)

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Exercise for Muscular Fitness

- Improve muscle's strength, power, and/or endurance
- <u>Recommendations for General Public</u>
  - Strength
    - Each muscle group: 8-12 reps, 1-4 sets, 2-3 times/week, 48-72 hours rest between sessions
  - Power
    - 3-6 reps (faster movements), 1-3 sets, 2-3 times/week
  - Endurance
    - 15-25 reps (lighter weights), 1-2 sets, 2-3 times/week

Theoretical Differences in Methods (Suchomel, 2018)

Resistance training method	Hypertrophy	Strength	Power
Bodyweight exercise	+	+	++
Machine-based exercise	++	++	++
Weightlifting derivatives	+++	+++	+++++
Plyometrics	+	++	++++
Eccentric training	+++++	+++++	++++
Potentiation complexes	[a]	+++	+++++
Unilateral exercise	+++	++	+++
Bilateral exercise	++++	++++	+++
Variable resistance	+++++	++++	++++
Kettlebell training	++	++	+++
Ballistic training	++	+++	+++++

Exercise for Flexibility

- Improves joint range of motion, posture, and components of balance
- No consistent link to injury prevention or reduced muscle soreness after exercise
- Most effective with warm muscles
- Static stretch, hold for 10-60 seconds, 2-4 sets, 2-3 days/week

Neuromotor Exercise

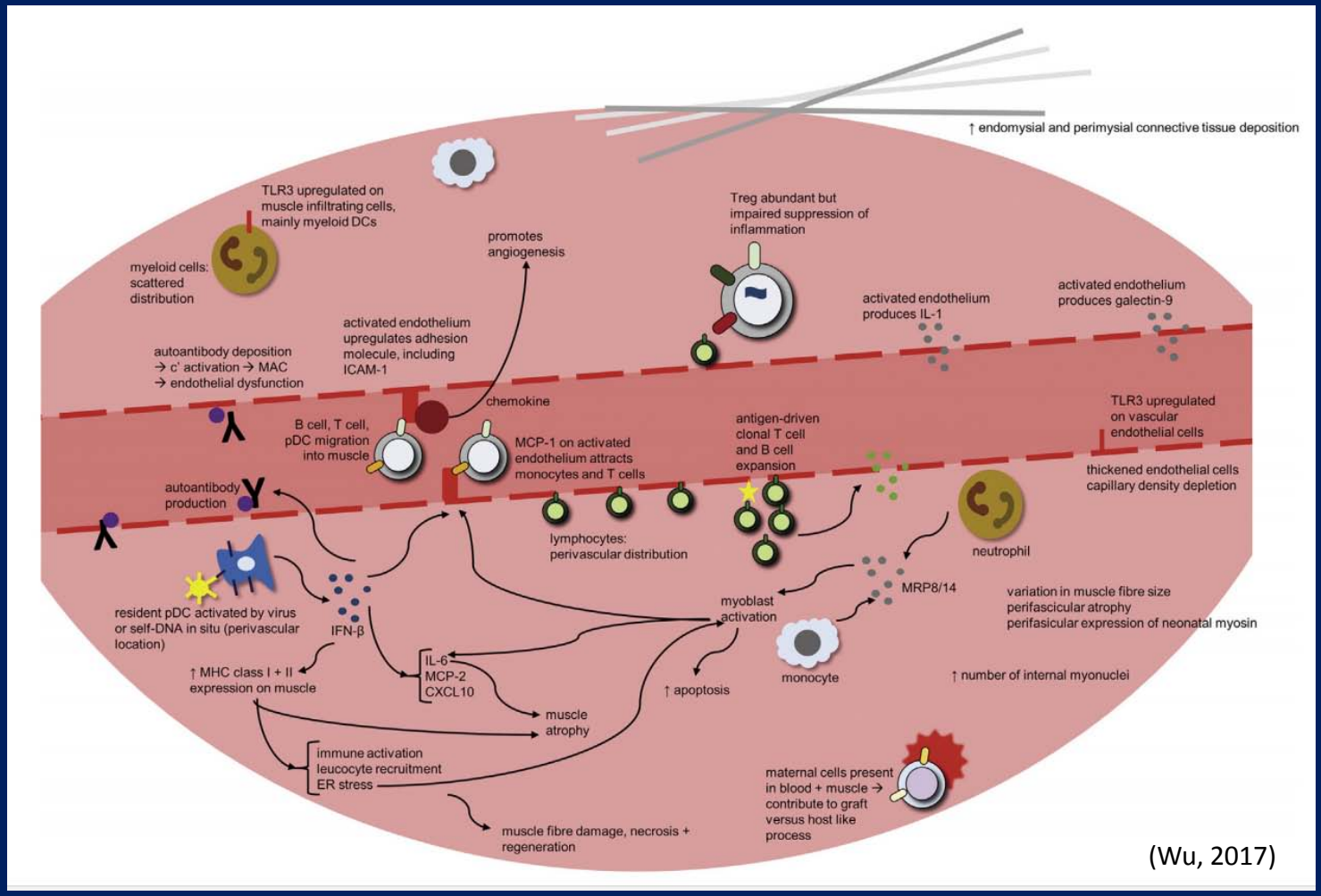
- Activities that incorporate balance, coordination, agility, and awareness of body movement
  - Yoga, Tai chi
- Improves balance, agility, and health-related quality of life in older people
- Limited research in younger populations

Whole-Body Functional Exercises

- Typically perform "functional tasks" to muscle failure
- Can be beneficial for certain populations
- Best practiced with a rehabilitation professional

Is Exercise *Safe* for People with Inflammatory Myopathies?

Muscle Damage in Juvenile Dermatomyositis (JDM)



(Wu, 2017)

Problems Associated with JDM

- Weakness
- Muscle fatigue
- Fatigue
- Decreased bone density
- Low quality of life
- Medication side-effects

- ***What are the effects of a sedentary lifestyle on these issues?***

Exercise and JDM

Omori & Colleagues (2012)

- 10 subjects with JDM
  - Ages 7-17 (12±3.2) years, 5 males, 5 females
  - Disease activity: 6 active, 4 nonactive
- 12 weeks of exercise training
  - 20 min strengthening exercises (8-12 reps, 3 sets)
  - 30 min treadmill walking [aerobic exercise] 70% peak
  - 5 min stretching
- Results
  - Improved quality of life, increased: strength, bone density, aerobic fitness
  - No injuries or worsening of disease

Riisager & Colleagues (2013)

- 10 subjects in JDM remission
  - Ages 16-42, 1 male, 9 females
  - Remission length 1.2-30 years
- 42 exercise sessions over 12 weeks (every other day)
  - Exercise bike for 20 up to 40 min
  - Intensity via heart rate at ~75-80% max;
  - 8 completed all 12 weeks
- Results
  - Improvements in aerobic fitness, 6-min walk test distance
  - No change in disease status

Habers & Colleagues (2016)

- 14, 12 subjects with JDM in two different groups
  - Ages ~8-17 years, 64% and 58% females in each group
  - Second group delayed start of exercise program
- 12-week home-based exercise program
  - Treadmill intervals, 3 times/week, 40-60 min
    - Start with 4-7, 3-min intervals at 65-70% max heart rate
    - Progress to 10-12, 1 to 2-min intervals, 80-90% max heart rate
  - Strength training: squats, sit-ups, push-ups
    - Initially 3 reps, 3 sets during first week
    - Weeks 2-12: as many as can accomplish in 20-30 seconds
  - 11 and 7 completed exercise training

Habers & Colleagues (2016)

- Results
  - Improvements noted in muscle function:
    - Standing long-jump distance
    - Push-ups performed in 30 seconds
    - Sit-ups performed in 30 seconds
  - Reduced disability after training
    - Childhood Health Assessment Questionnaire 30+8
  - No worsening of disease status

Things We Need to Understand Better

- How should exercise be adjusted during active phases of disease?
- Do disease subtypes need different exercise precautions and prescriptions?
- How can we prescribe exercise to get better and faster results?

Summary

- Exercise appears to be safe
- The following forms of exercise have been used successfully in JDM:
  - Aerobic exercise (walking, exercise bike)
  - Strength training using weight machines
  - Strength training using body weight resistance
- Studies employed training programs similar to those used by general public
  - *Overload* (reps, sets, intensity), *Progression* etc.

Summary

- Seek to improve **Physical Fitness**
  - Start with more activities that aren't "exercise"
  - Disrupt sedentary behavior whenever possible
  - Progress towards formal exercise when appropriate
- Research will continue to inform our understanding of how to better incorporate exercise

Questions?

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